

REMARKS

The application has been reviewed in light of the Office Action dated February 23, 2006. Claims 1-20 are pending and presented for reconsideration, with claims 1 and 11 being in independent form.

The specification was objected to as having informalities.

By this Amendment, the specification has been reviewed and amended to correct the formal matters noted in the Office Action.

Withdrawal of the objection to the specification is respectfully requested.

Claims 1 and 11 were rejected under 35 U.S.C. § 102(a) as purportedly anticipated by U.S. Patent No. 4,259,580 to Vogler. Claims 2, 3, 6, 12, 13, and 16 were rejected under 35 U.S.C. § 103(a) as purportedly obvious over Vogler in view of U.S. Patent No. 6,366,865 to Chalupa et al. and further in view of U.S. Patent Application Publication No. 2002/0008537 A1 (Bonduel et al.). Claims 4, 5, 14 and 15 were rejected under 35 U.S.C. § 103(a) as purportedly obvious over Vogler in view of U.S. Patent No. 4,701,683 to Kikkawa. Claims 7-10 and 17-20 were rejected under 35 U.S.C. § 103(a) as purportedly obvious over Vogler in view of Chalupa and Bonduel and further in view of U.S. Patent No. 6,341,155 to Kuzniar.

Applicant has carefully considered the Examiner's comments and the cited art, and respectfully submits that independent claims 1 and 11 are patentable over the cited art, for at least the following reasons.

This application relates to control of rotation of an anode with a motor in an X-ray tube device to avoid instantaneous burning of the anode target by the impinging beams. Conventionally, it has been proposed to wait a predetermined amount of time which is approximated to allow anode rotation to reach a predetermined rotation number. However, the

actual amount of time before anode rotation reaches the rotation number can vary according to several factors.

Applicant devised an improved technique for detecting the rotation number of the anode wherein the impedance is calculated by the information of voltage and current or of current only related to a stator coil which generates the rotating magnetic field to rotate the motor and the anode rotation number is detected by the initial impedance and the current impedance. Each of independent claims 1 and 11 addresses these features, as well as additional features.

Vogler, as understood by Applicant, proposes an approach for determining the anode rotation number by multiplying together the currents through the two stator winding pairs and multiply the product by the sine of the phase angle between the two currents. More specifically, Vogler (see column 8, lines 4-25) proposes a rotary anode drive motor that includes a rotor coupled to the rotary anode and first and second stator windings disposed at right angles about the axis of rotation of the rotary anode, means for sensing starting currents I_1 and I_2 flowing in the respective first and second stator windings, an arithmetic device having an input coupled to the output of the current sensing means and including means for deriving an output signal which is proportional to the time integral of a product $I_1 - I_2 \sin \alpha$, i_1 and i_2 being the amplitudes of the stator winding currents i_1 and i_2 , respectively and α being the phase angle between the two stator currents i_1 and i_2 , means for applying said output signal to a first input of a comparison circuit, means for supplying a preset reference value signal indicative of a minimum required anode speed to a second input of the comparison circuit such that the comparison circuit produces an output control signal if the output signal of the arithmetic device exceeds the preset reference value signal, and means coupling the output control signal of the comparison circuit to the switching means for enabling an X-ray exposure.

Applicant does not find teaching or suggestion in Vogler of an anode rotation number detecting means for detecting the rotation number of the anode on the basis of impedance information determined from information of voltage and current or of current only related to a stator coil for generating a rotating magnetic field to rotate the motor, as provided by the claimed invention of claims 1 and 11.

The other cited references, which were only cited in connection with dependent claims in the present application, also fail to disclose or suggest the claimed invention.

Chalupa, as understood by Applicant, proposes a technique for estimating the coil resistance of an electric motor by utilizing a voltage across a stator coil and a current through a coil. The coil resistance is then used to approximate the rotor position relative to the stator, more specifically, an angle ϕ between the rotor and the stator.

On the other hand, Chalupa does not suggest that (or how) the techniques proposed therein can be adapted to determine rotation number of the anode. Therefore, it would not have been obvious to modify Vogler based on Chalupa in the manner suggested in the Office Action.

Bonduel, as understood by Applicant, proposes an approach for monitoring the rotation of a DC electric motor, wherein the voltage and current supplying the motor are measured by sampling over time. The voltage and current measurements are utilized to estimate angular position and angular speed.

However, Bonduel does not suggest that (or how) the techniques proposed therein can be adapted to determine rotation number of the anode. Therefore, it would not have been obvious to modify Vogler based on Bonduel in the manner suggested in the Office Action.

Kikkawa, as understood by Applicant, proposes a pulse wave inverter circuit for driving a brushless motor. The pulse wave inverter circuit proposed by Kikkawa has two PNP transistors

and two NPN transistors which are arranged such that the transistors are connected in the form of a bridge.

Kuzniar, as understood by Applicant, proposes a rotation monitoring system for detecting the rotational speed of an anode of an x-ray tube during use. The system proposed by Kuzniar includes a detector, which detects a pulse of secondary x-rays generated by the interaction of a stream of electrons with a known defect on a surface of the anode. The detector may be positioned inside or outside a vacuum envelope of the x-ray tube. The stream of electrons is supplied by a secondary source, separate from a main source of electrons used to generate the primary or working x-ray beam of the x-ray tube. A single pulse is detected with each rotation of the anode and this information is utilized to correct the rotational speed of the anode.

Applicant does not find disclosure or suggestion in the cited art, however, of an X-ray tube device having an anode rotation mechanism for rotating an anode with a motor, and further comprising an anode rotation number detecting means for detecting the rotation number of the anode wherein the impedance is calculated by the information of voltage and current or of current only related to a stator coil which generates the rotating magnetic field to rotate the motor and the anode rotation number is detected by the initial impedance and the current impedance, as provided by claim 1.

Independent claim 11 is patentably distinct from the cited art for at least similar reasons.

Accordingly, for at least the above-stated reasons, Applicant respectfully submits that independent claims 1 and 11, and the claims depending therefrom, are patentable over the cited art.

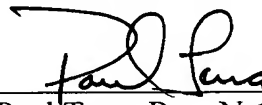
In view of the amendments to the claims and remarks hereinabove, Applicant submits that the application is now in condition for allowance. Accordingly, Applicant earnestly solicits the

allowance of the application.

If a petition for an extension of time is required to make this response timely, this paper should be considered to be such a petition. The Patent Office is hereby authorized to charge any fees that may be required in connection with this amendment and to credit any overpayment to our Deposit Account No. 03-3125.

If a telephone interview could advance the prosecution of this application, the Examiner is respectfully requested to call the undersigned attorney.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Paul Teng", is written over a horizontal line.

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